

## P-4.2 Use diagrams to illustrate an electric field (including point charges and electric field lines).

Revised Taxonomy Level    3.2 C<sub>A</sub> **Apply (use) procedural knowledge**  
2.2-B **Exemplify (illustrate) conceptual knowledge**

### Key Concepts

Electric field

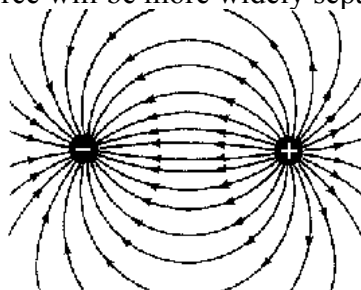
Electric field lines

Coulomb

Students did not address electric fields in physical science

### It is essential for students to

- ❖ Have a conceptual understanding of Coulomb's law and be able explain how the force is affected by the charge on each particle and the distance between the particles.
- ❖ Understand that the quantity of charge on a body, represented by the letter Q, is determined by the number of electrons in excess of (or less than) the number of protons
- ❖ Understand that an electric field is said to exist in a region of space if an electric point charge placed in that region is subject to an electric force
- ❖ Understand that the quantity of charge is measured in coulombs (C)
  - 1 coulomb = the charge on  $6.25 \times 10^{18}$  electrons
- ❖ Interpret the information given in a drawing of an electric field
  - Electric line of force
    - ◆ drawn so that a tangent to it at any point indicates the orientation of the electric field at that point
    - ◆ indicates the path of a positively charged test-charge moving in response to the force of the electric field
    - ◆ originate at the surface of a positively charged body and terminate at the surface of a negatively charged body.
    - ◆ drawn normal to the surface of the charged conducting body where it joins the surface
  - The intensity (or strength) of an electrical field as well as the direction are represented graphically by lines of force.
    - ◆ The electric field intensity is proportional to the number of lines of force per unit area normal to the field
      - Where intensity is high, the lines will be close together, where the intensity is low, the lines of force will be more widely separated.



- Explain the difference in concept between electric force and an electric field
  - ◆ Electric field intensity (E) at any point is defined as the force per unit positive charge at that point, and is measured in units of newtons/coulomb
  - ◆  $E = F/q$

### **Traditional course differentiation**

- ❖ Solve problems involving Coulombs law

### **Assessment**

The verb exemplify (illustrate) means to find a specific example or illustration of a concept or principle, therefore the major focus of assessment will be for students to give examples that show that they understand how a charged particle is affected by an electric field. Conceptual knowledge requires that students understand the interrelationships among the basic elements within a larger structure that enable them to function together. In this case, that students understand the characteristics of an electric field and the ways that different charged objects can be affected by an electric field.

Because students must demonstrate conceptual knowledge, assessments should require that students justify why their examples meet the above criteria.

The other revised taxonomy verb for this indicator is implement (use), the major focus of assessment will be for students to show that they can “apply a procedure to an unfamiliar task”. The knowledge dimension of the indicator, procedural knowledge means “knowledge of subject-specific techniques and methods” In this case the procedure for producing an electric field drawing. A key part of the assessment will be for students to show that they can apply the knowledge to a new situation, not just repeat problems which are familiar. This requires that students have a conceptual understanding of electric charge and electric fields.